

CLAIMS

We claim:

- 1 1. A method for monitoring the condition of a fluid dielectric in an RF system
2 comprising the steps of:
3 transmitting optical radiation through a portion of said fluid dielectric contained
4 within a dielectric substrate of said RF system;
5 measuring at least one parameter indicative of a change of transmission direction
6 of said optical radiation caused by said fluid dielectric.
- 1 2. The method according to claim 1 further comprising the step of selecting a
2 material for said dielectric substrate to be a low temperature cofired ceramic.
- 1 3. The method according to claim 1 further comprising the step of comparing said
2 change in direction to an expected change of direction for said fluid dielectric in a non-
3 degraded condition.
- 1 4. The method according to claim 1 further comprising the step of calculating a
2 refractive index of said fluid dielectric.
- 1 5. The method according to claim 3 further comprising the step of comparing said
2 refractive index to an expected refractive index of said fluid dielectric in a non-degraded
3 condition.

1 6. The method according to claim 1 further comprising the step of dynamically
2 varying an angle of incidence of said transmitted optical radiation upon said fluid
3 dielectric.

1 7. The method according to claim 6 further comprising the step of controlling a
2 Micro-Opto-Electro-Mechanical System (MOEMS) to vary said angle of incidence.

1 8. The method according to claim 1 further comprising the step of selecting said
2 optical radiation from the group consisting of infrared, ultraviolet, and visible light.

1 9. The method according to claim 1 further comprising the step of communicating a
2 fault notification if a condition of said fluid dielectric is degraded.

1 10. The method according to claim 1 further comprising the step of determining a
2 condition of said fluid dielectric based on said parameter.

1 11. The method according to claim 1 further comprising the step of modifying at least
2 one operating parameter of said RF system if a condition of said fluid dielectric is
3 determined to be degraded.

1 12. The method according to claim 11 wherein said at least one operating parameter
2 that is modified is selected to compensate for an effect to said RF system caused by
3 said fluid dielectric that is determined to be degraded.

- 1 13. An RF system comprising:
2 an RF circuit disposed on a dielectric substrate;
3 a fluid dielectric contained within said dielectric substrate;
4 a light source transmitting optical radiation through a portion of said fluid
5 dielectric; and
6 a sensor measuring at least one parameter indicative of a change of
7 transmission direction of said optical radiation caused by said fluid dielectric.
- 1 14. The RF system according to claim 13 wherein at least one of said light source
2 and said sensor is embedded within said dielectric substrate.
- 1 15. The RF system according to claim 13 wherein said substrate is a low
2 temperature cofired ceramic.
- 1 16. The RF system according to claim 13 wherein said processor compares said
2 change of direction to an expected change of direction for said fluid dielectric in a non-
3 degraded condition.
- 1 17. The RF system according to claim 13 wherein said processor calculates a
2 refractive index of said fluid dielectric.

1 18. The RF system according to claim 17 wherein said processor compares said
2 refractive index to an expected refractive index of said fluid dielectric in a non-degraded
3 condition.

1 19. The RF system according to claim 13 further comprising a light steering device
2 responsive to a control signal, said light steering device selectively varying an angle of
3 incidence of said transmitted optical radiation upon said fluid dielectric.

1 20. The RF system according to claim 19 wherein said light steering device
2 comprises a Micro-Opto-Electro-Mechanical System (MOEMS) device.

1 21. The RF system according to claim 20 wherein said MOEMS device is embedded
2 in a dielectric substrate of said RF system.

1 22. The RF system according to claim 13 wherein said optical radiation produced by
2 said light source is selected from the group consisting of infrared, ultraviolet, and visible
3 light.

1 23. The RF system according to claim 13 wherein said processor transmits a fault
2 notification if a condition of said fluid dielectric is degraded.

1 24. The RF system according to claim 13 wherein at least one operating parameter
2 of said RF system is modified if a condition of said fluid dielectric is determined to be
3 degraded.

1 25. The RF system according to claim 24 wherein said at least one operating
2 parameter that is modified is selected to compensate for an effect to said RF system
3 caused by said fluid dielectric that is determined to be degraded.

1 26. The RF system according to claim 13 further comprising a processor responsive
2 to an output of said sensor, said processor determining a condition of said fluid
3 dielectric based on said parameter.

1 27. The RF system according to claim 26 wherein said condition affects at least one
2 electrical characteristic of said fluid dielectric.

1 28. The RF system according to claim 26 wherein said electrical characteristic is at
2 least one of a permittivity and a permeability.